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Reviews.

DICTIONARY OF MECHANICS.

"The Practical Dictionary of Mechanics." By Edward H. Knight, Civil and Mechanical Engineer, U.S. London: Cassell, Petter, and Galpin. United States: H. O. Houghton and Co., the Riverside Press, Cambridge, Massachusetts. (Serial).

In these days when mechanism of various kinds is to be found everywhere, doing all sorts of work of utility, and even helping in an efficient manner the artist and the caterer of amusing recreations, a general knowledge of the theory and construction of some machinery which happens to be brought under notice is a desideratum. By this Practical Dictionary of Mechanics the knowledge desired to be attained will be supplied without loss of time or trouble.

To the practical engineer and machinist the work will be of the utmost value, for although we have works of a similar character already before the public, yet they are works of yesterday and not of to-day, this in practical science being no small matter. And since our engineers and mechanics are usually very ill-informed as to any machines outside of the class with which they have practical relations, a ready informant on all classes of machinery like the present work cannot fail to be valuable, especially when it can be secured at such a cheap rate as sevenpence per part.

The parts presented to us reach No. 5, and it is not too much to say that they are quite equal to all reasonable requirements.

UNWIN ON MACHINE DESIGN.

"The Elements of Machine Design; an Introduction to the Principles which determine the arrangement and proportions of the parts of Machines, and a collection of Rules for Machine Designs." By W. Cawthorne Unwin, B.S., A. Inst., C.E. London: Longmans, Green, and Co. 1877.

The subject of machine design, so far as English works are concerned, has been but imperfectly dealt with. It is a science of itself, although from its alliance to applied machinery it has (as Renbaux states) been placed in an indirect position as a part of applied mechanics.

The works usually comprised under the title of Applied Mechanics invariably embrace some parts of machine design, but it is only imperfectly comprehended in such works, therefore this little work (which forms one of the valuable series of text books of science issued by Messrs. Longman) is doubly valuable as being one that will help forward students in the study of machine design.

The primary object of this work the author states is "to explain the principles which are invaluable as guides in machine construction. So far as it succeeds in this it will place a draughtsman in the best position to make use of the facts which come under his notice in the workshop and the drawing office, and will enable him to apply that experience in detail, with new materials, with new forms of construction, and with novel conditions of force and speed. In addition this text book contains a selection of practical rules and empirical proportions for various parts of machines. These are not intended to override the draughtsman's judgment and experience."

There is one thing in this work to which objection might be taken, and which objection the author has foreshadowed, that is the amount of mathematical formule, but this, the author states, has been rendered necessary partially by condensing the work into small proportions.

We think, however, that where by plain language the same views may be conveyed, although the result would be to increase the size of the book, it would be far preferable, for, take the case of a working man desirous of acquiring a knowledge of machine design, and who is not acquainted with algebra or trigonometry, this work would, in some portions, be unintelligible.

As a whole, however, we can heartily recommend this work.

TEXT BOOK OF STRUCTURAL AND PHYSIOLOGICAL BOTANY.

"Text Book of Structural and Physiological Botany." By Otto W. Thome, Ordinary Professor of Botany at the School of Science and Art, Cologne. Translated and Edited by Alfred W. Bennett, M.A., B.Sc., F.L.S. London: Longmans, Green, and Co.

This text book, which forms another of the series of text books of science published by Messrs. Longman, seems to be a departure from the original course, inasmuch as it is a work translated and edited from the German, as above stated.

As the original, according to the editor, is the recognised text book in Germany, we think no more fitting place could be found than its addition to the series of text books of science.

As the original is now in its fourth edition we think that of itself will speak in recommendation of the work without our adding any further recommendation.

KINGZETT ON THE ALKALI TRADE.

The History, Products, and Processes of the Alkali Trade, including the most recent improvements. By Charles Thomas Kingzett (Consulting Chemist). With 23 illustrations. London: Longmans, Green, and Co. 1877.

This work is unmistakably the production of a scientific practical chemist, and is as complete in every respect as the most exacting critic can well require.

Mr. Kingzett states, and truly, that not only has he bestowed attention on the science of the subject, but has given much attention to propositions and suggestions for improved processes; and as regards processes actually in use, he has, whilst describing them with scientific accuracy, avoided all unnecessary technicalities, so that the book may be readable alike to the outside public and those engaged in the trade. Further, in order to make the book as complete in itself as possible, beyond the history and descriptive accounts of the various processes, he has given attention to the uses of the products in other arts and manufactures; placing particular stress upon waste products and their possible utilisation, while the statistics in reference to the trade will be found to accurately indicate its extent.

Mr. Kingzett acknowledges the valuable help received from his friend Mr. George Chaloner, who, as editor of *Iron*, bestowed especial care and aid during the publication of the following chapters in that journal. He also proffers his thanks as due to Mr. Richard Cail and Mr. Edmund K. Muspratt, the hon. secretaries of the Soda Association, for having furnished him with some valuable statistics. He also acknowledges his gratitude for drawings of plant and useful information from Messrs. William John Glover, Mr. Walter Weldon, Dr. Sprengel, Mr. James Mactear, Mr. W. Henderson, Mr. G. E. Davis, Mr. Claudet, Mr. J. Cammack, and Messrs. Daglish and Co., of St. Helens.

Perhaps the following passages from this very practical work will illustrate the careful and complete way in which Mr. Kingzett deals with this subject:—

Manufacture of Bleaching Powder, Bleaching Liquor, Chlorate of Potassium, and Epsom Salts.—Bleaching powder is produced commercially by the action of chlorine prepared by any of the aforedescribed processes upon slaked lime.

The chlorine gas is first dried by passage through small leaden or other purifiers, packed with coke or flints, kept well supplied with strong sulphuric acid. In many works the chlorine is washed by passing it through water before drying. This is done in order to prevent the occurrence of traces of manganese in the bleaching powder—for it is asserted that peroxide of manganese, even when present in very minute amounts, greatly facilitates the spontaneous decomposition of the product, with the evolution of oxygen. This is a matter, however, yet requiring investigation. The choice of the lime used is of much importance, many kinds containing traces of ferric or manganic oxide; and such substances give to the "bleach" the induced liability to decomposition already referred to. Such lime is to be identified by its yellow colour. Irish and French limestones furnish, by a process of calcination, most of the lime used in this country, as they give a "heavy" lime, which is the best sort to employ. Large quantities of limestone are also obtained from Buxton.

Having obtained the lime in a well-burnt state, it has next to be carefully slaked; if too much water be employed in the operation, the product agglomerates; and if too little water be used, the product absorbs chlorine imperfectly. After slaking, it is sifted from the "yelks"—that is, unburned carbonate, pebbles and impurities—and should then contain about 24 per cent. water, in addition to that amount necessary to form hydrate of lime. The vessels, in which the absorption of chlorine by the time takes place are called "chambers," and, as originally constructed, were virtually leaden receivers, in which the lime was stirred from time to time.

When bleaching powder was first made on the Tyne—viz., in 1830, by Losh, Wilson, and Bell—wooden chambers covered with pitch were used. Then came chambers of brick, which gave way eventually to others constructed of stone (Yorkshire flagstone), or lead, or both; some, however, are constructed of iron. Usually, these chambers are built upon the ground, but sometimes they are supported upon a wooden framework. It was usual, moreover, in the past, to place the lime upon a series of shelves to a depth of 5 to 8 centim. (2 to 3 inches); these shelves were situated about 6 inches one above the other, and three or four in number were used. Except where chlorine generated by Deacon's process is used, shelves are no longer employed; and instead thereof, the lime is placed upon the floor to a depth of about six inches.

Chambers, as now usually constructed. are from 50 to 60 feet long, 25 to 30 feet wide, and from 5 to 6 feet high. Most of them are built of lead, in which case they are tarred inside. In any case the bleaching powder is kept from contact with the metal, by having the sides (to the depth of the lime) built of flagstones, on which the leaden or iron body rests. The chambers are provided with doors which are luted on, after the charge of lime has been introduced, and there are also small windows through which may be seen the colour of the gas, a criterion, to an experienced workman, of the progress of the absorption.

The charge of lime varies according to the size of the chamber, 72 cwt. sometimes being employed, and sometimes 144 cwt. This having been introduced and the chambers closed, the gas is allowed to enter slowly; if the operation proceeds too quickly, the temperature rises owing to the combination, and the hypochlorite of calcium which is formed, decomposes into chlorate and chloride. The temperature generally observed is 62° Fahr., although Scheurer-Kestner is of opinion that a temperature of 130° Fahr. is not injurious so long as the chlorine does not enter too rapidly. 12 cwt.

of good lime yield about 20 cwt. of bleaching powder, testing 37 per cent. chlorine; or, expressed generally, 100 parts of lime should absorb from 64 to 66 parts of chlorine, giving a product testing from 35 to 37 per cent. chlorine.

Under ordinary conditions, 36 to 48 hours are required to saturate the lime with chlorine; when completed, the residual chlorine is drawn off by chimney draft or otherwise, into a freshly charged chamber, leaving the contents ready for packing. The doors are now unluted, and the "bleach" is drawn by wooden rakes towards them, by workmen who protect themselves from the chlorine by holding in their mouths wet rags or flannel. The powder is packed firmly in dry wooden casks, and in this state is supplied to the market.

The following analyses of bleaching powder are by Mr. G. E. Davis, and may be taken as fairly representative :—

ANALYSES OF GOOD SAMPLES.

Form of Chlorine.	1	2	3	4	5
Total chlorine	36·40	35·54	38·62	37·76	39·52
Active chlorine	35·12	35·00	35·50	35·87	36.11

ANALYSES OF BAD SAMPLES.

Form of Chlorine.	1	2	3	4	5
Total chlorine	33·86	37·24	30·52	30·90	37 51
Active chlorine	30·25	31·33	29·46	27.87	32·30

The actual value of the powder depends upon its percentage of active chlorine, and the difference between the percentages of total and active chlorine, is that amount in combination as chloride of calcium, which is of course useless for bleaching purposes. The commercial bleaching powder has therefore a composition which may be represented by

$$CaO\left\{\begin{matrix}Cl\\OCl\end{matrix}\right. + xCaO + xH_2O,$$

and contains on the average, 35 to 39 per cent. chlorine, 43 to 44 per cent. lime, and 15 to 16 per cent. water, with traces of foreign matters.

Bleaching powder slowly undergoes spontaneous decomposition, and Mr. J. Pattinson finds that during a summer month the loss of available chlorine may rise as high as 0·86 per cent. on the average; in a winter month, it loses about 0·26 per cent. on the average.

In a factory where 350 tons of salt were decomposed weekly, and the strong hydrochloric acid employed in making "bleach," the following were the working results, reduced to a standard of 20 cwt. of salt:—Common salt, 2,240 parts; hydrochloric acid at 28° Tw., 2,753 parts; manganese at 60 per cent. = 448 parts; producing 416 parts of bleach at 39 per cent. (Richardson and Watts). These figures relate to the industry prior to the revolution brought about by the introduction of the Weldon process; so also do the following figures, taken from the same source:—Eight large stills in Lancashire supplied five chambers, each still being charged with 7 or 8 cwt. of manganese, and 90 cubic feet of acid at 28° Tw. Each chamber was charged with 43 cwt. lime, taking a week for complete saturation, and giving a production of 64 cwt. of "bleach" at 35 per cent. strength.

Using Weldon's process for the generation of the chlorine, a ton of "bleach" is produced from about 50 to 55 cwt. of salt, decomposed. In the Lancashire district, during 1866, it is calculated that 20,000 tons of bleaching powder were produced by twenty manufacturers, while in 1867 the Tyne district yielded 27,000 tons. In 1871, the estimated production of Great Britain and Ireland was 75,000 tons, selling at £10 per ton, giving, therefore, a total value of three-quarters of a million sterling. At the present time the annual production is about 100,000 tons, and over 90 per cent. of this is made, using Weldon's form of chlorine process; but this latter calculation does not include about 10,000 tons made by Dunlop's process in Glasgow. In 1799, bleaching powder had a value of £168 per ton; its present value is £5 per ton.

Of late years, certain attempts have been made to introduce an improved form of apparatus or chamber in which the lime absorbs chlorine. We have seen that where Deacon's process is used, it is so contrived that the partly saturated lime is exposed first to the action of the stronger gas, etc. This idea, we believe, originated with Mr. Gamble, but it is the same idea that pervades the use of the various pieces of apparatus recently devised. That is to say, in all of them it is attempted to bring the gas into more intimate contact with the lime, thus effecting the absorption in a less time than otherwise. This is a result especially desirable to obtain, when a dilute gas is employed, such a gas, in fact, as that furnished in Deacon's process.

Thus, in some places, revolving cylinders have been employed, and where first adopted by Oberkampf and Widmer in Germany (1816). At home, these cylinders were of sheet iron, 5 feet in diameter, 14 feet long, and coated with cement internally. Each cylinder was charged with 14 cwt. of lime, and made about 12 to 15 revolutions per hour. The casks in which the powder was packed, were placed beneath the cylinders, and received their charges after passing through a tammy (sieve). It is conceivable that, using the form of chamber now generally adopted, a simple piece of machinery might be devised, which should act as a haymaking machine, by constantly exposing fresh surfaces of lime to the action of the chlorine. In such case, lime might be used to the depth of several feet.

Mr. Bramwell, of St. Helens, has patented the use of an apparatus, which consists essentially of an iron cylinder, provided with pipes for working the gases, and a door for discharging the finished powder. The cylinder is provided with a rod passing through its centre (horizontally), and from this rod project a number of arms in various directions. When the cylinder is charged with lime, gas is admitted, and the apparatus within, is caused to work up and down, thus making minute spaces in the lime, into which the gas is supposed to enter, and thus effect the object of the invention. So far as we can learn, however, it has not been tried at all, although if it worked it would have the decided advantage of economising space—no mean consideration.

In another tower-form of chamber, patented by Mr. Leather, of St. Helens, the lime falls in the form of powder from a hopper, and is kept in agitation as it falls, the chlorine meeting it from below. We are informed that the experiments made a short time since with this tower-method of making bleach, gave results not at all satisfactory.

In a third apparatus of Mr. Hargreaves, the lime is placed at the top of a spiral shelf, and is moved gradually downwards by means of a scraper, which, in its action, thus continually exposes fresh surfaces of lime to the chlorine, which enters below and meets the lime in its descent. By the time the lime reaches the bottom, it is supposed to be literally converted into "bleach," but, so far as we can learn, no experiments have yet been made with this apparatus.

In further reference to the manufacture of bleaching powder, the following notes by R. C. Clapham, relative to the trade, as practised in France, are not without interest. The Weldon process is now pretty largely used, but at the time of which we are writing (1874), it had not come into operation.

Instead of using stills, such as we have described in preceding chapters, the French used retorts, made of fire-clay, and not unlike Wolff's bottles in form. A charge consisted of 50 lb. of ground manganese, with sufficient hydrochloric acid of 30° to 32°, and was worked off either by the heat derived from a flue, or by steam. In this way a very complete decomposition of the manganese was effected, the chlorine being conveyed in glass pipes to the chambers. The latter were constructed of stone flags, containing a number of shelves, upon which the lime was spread, and the absorption was not allowed to extend above 32°, which is the usual French standard. Many persons claim for a "bleach" of this strength more stability than for stronger ones.

After observations as to bleach liquor and chlorate of potassium, illustrated with formula, the work states the interesting fact that magnesia may be readily obtained by simple roasting of the native carbonate which occurs in a nearly pure form as Greek stone or magnesite. *En passant*, it may be remarked that Epsom salts ($MgSO_4$) are made from this magnesite by the action of sulphuric acid. No less than 590 tons are made annually in the Tyne district (1867), and have an aggregate value of £4,720. Epsom salts are also made by Mr. Gamble, at St. Helens.

CHILDREN'S TREASURY AND ADVOCATE.

"The Children's Treasury and Advocate of the Homeless and Destitute." Edited by Dr. BARNARDO, of the East End Juvenile Mission. Houghton and Co., 10, Paternoster-row; the Book Society, 28, Paternoster-row.

DR. BARNARDO is doing such philanthropic and useful work that we cannot help saying a good word for this little work, which has now reached a high serial number.

FOREIGN SCIENCE.

Some more numbers of the little paper, *Correspondance Scientifique*, have reached us. With regard to the project for warming the 2nd and 3rd class carriages of French railways, that of M. Guitard and M. Bouley, it states that in the Académie des Sciences, approval has been expressed as to the ingenuity of the system, and as to its being efficacious and economical. description of the apparatus is to appear in that journal. The same paper goes fully into the Liétar lamp, described in our last instalment. M. Liétar, says the *Correspondance*, is an intelligent Belgian workman, and "thanks to his invention, we have no longer to fear those explosions, those accidents, and those fires which have made so many victims since the adoption of petroleum lighting." It goes pretty closely into the proceedings of the Académie, stating that the decree of the President of the Republic was received announcing the approval of the nomination of M. Hebert as member of the Académie in place of M. Ch. Sainte Claire, Mineralogical Section, M. Hebert being invited to take his seat. General Morin presented the 25th volume of the "Memorial des Officiers du Génie (Engineers)," stating that a very remarkable work might be read on optical processes to be employed for projecting the electric light long distances. There is a long article on legal chemistry, or a kind of medical jurisprudence; and on alimentary preserved substances. In regard to adulteration the following rather quaint statement is made. After stating that, as they had mentioned above, the introduction of sulphate of copper in preserving green peas and haricots was only to deceive the eye, they add, "Our poor humanity is so constituted; there are cases where it wishes or likes to be deceived. Thus it is certain that a person, who is a friend to the table of good cheer, would prefer a hundred times to eat peas, knowing that they contain an infinitesimal quantity of copper, on condition that they have an agreeable green appearance imitating nature, to the same preserves without copper, of yellowish appearance." M. Pasteur, the great chemist, says, that of fourteen boxes he bought at random, in the districts of Paris, ten contained a *dix milliéme* of copper in the total weight.

M. Ledieu has received a prize of 6,000 francs from the Académie for works on the application of steam in the navy. He has opened new views on the dynamic theory of heat. The Marthyon prize in mechanics has been awarded to M. Deprez. Amongst other things he recently had an indicator of pressure constructed, applicable to the most rapid steam engines, which protects the observer from, even at the greatest speeds, errors of appreciation resulting most frequently from the inertia of the piston of the indicator. The employment of this indicator, says *Cosmos*, promises to let us know with certainty all the conditions of the distribution and detention of steam in the motive cylinder of an engine which will make more than 250 turns a minute, to the advantage of the essential study of the mechanical and physical quantities of steam in the whole circumstances of its work of expansion. The Lalande prize is given to Mr. Palisa, director of the Observatory at Pola, for the discovery of nine planets between Mars and Jupiter in 1874-5, and rediscovery in 1876 of Maïa, lost for fifteen years. The centenary of Gay-Lessac, the great chemist and physician, will be celebrated by a festival, and the erection of his statue either at Limoges or Paris. Some calculators have been invented by M. Chambon, which will be of service in schools and in the transactions of banks. *Cosmos* recommends the Tachypolyplasiasme (!), saying the success we predict for the invention is not imaginary, if, as we hope, M. Chambon has the good fortune to meet some capitalist disposed to give him a generous support in respect of his intelligent efforts. L'Abbé Chappey writes that he saw the following in the *Union de l'Ouest:* The American General Berdan, author of a new instrument, has just sold to the Prussian Government the secret of his new discovery. This instrument consists of a telescopic apparatus which may be applied to cannons and guns, and which gives them a sure aim at two kilometres, an almost sure aim at three kilometres, and something effective at 4,500 metres. Experience already has testified that the use of this apparatus is destined to produce a true revolution in the art of war, from which serious consequences will follow.

ANNUAL GENERAL MEETING OF THE INVENTORS' INSTITUTE.

On Thursday, the 24th of May, the fifteenth annual general meeting of the members of the Inventors' Institute, was held at 4, St. Martin's-place, W.C. The President of the Institute, Sir **Antonio Brady**, being in the chair. The meeting was well attended, amongst those present exclusive of the president, being Messrs. A. J. Murray, Dr. J. Mc'Grigor Croft, F. H. Varley, D. J. McLauchlan, T. Morgan, M. Zingler, S. Calley, J. P. Cutts, J. E. K. Cutts, J. Newall, T. Blanchett, Mr. F. W. Campin, the secretary, and other well-known members of the Institute.

The proceedings commenced by the President calling upon the Secretary, Mr. F. W. **Campin**, to read the minutes of the last annual general meeting, which, being done, the same were confirmed by unanimous vote of the meeting.

The chairman then read the Report of the Executive Council as follows :—

The Fifteenth Annual Report of the Executive Council of the Inventors' Institute.

Our annual general meeting has, for the third time, to be held whilst Parliamentary action on the amendment of the Patent Law is subsisting.

To understand our present position we must bear in remembrance that two previous years (1875 and 1876) have witnessed the introduction of Bills professing to amend the Patent Laws, and that these Bills, after passing through various stages in the House of Lords where they were introduced, being delayed in the House of Commons, when the Session ended had not passed into Acts of Parliament. The Bills referred to were introduced by the Lord Chancellor, who is therefore entitled to be credited with the authorship of them.

The Bill (for it was essentially the same Bill in each year) contained so many objectionable features that though some of these were eliminated by his lordship during the stages of its progress, yet those remaining unaltered were of such a character as to make every well-wisher of the inventors' cause feel relieved of much anxiety when the end of the Session came, and the Patent Bill remained unpassed.

That the Bill did not pass was mainly due to the action of the Inventors' Institute, for although numerous organizations, notably the Artizans' and Inventors' Patent Law Amendment Committee, and various public bodies took action against these Bills, yet it is not too much to say that the Inventors' Institute was the efficient guide directing their action.

After two fruitless attempts at legislation, many persons were of opinion that the Government would do nothing further in the matter, and it was almost a surprise to find that in Her Majesty's speech from the throne on the opening of the present session of Parliament the law of patents for inventions was named as one of the subjects to be brought before Parliament by Government.

In pursuance of this statement in the Queen's speech the Bill, or rather a similar Bill, somewhat modified, was on one of the early days of the Session laid before the House of Commons.

This Bill, as introduced by the Attorney General, was undoubtedly a great improvement upon the Bills of the two preceding years, inasmuch as provisional protection of not less than *one year* is to be accorded, and for one half the present payment. Further, the patent up to and including sealing, is to be obtainable at the same rate of reduced charges. And the term for which a patent is to be obtainable is extended to 21 years, instead of being limited to 14, as formerly, which is a great boon.

This Bill, however, is equally objectionable with the former Bills as regards the examination arrangements; the forfeiture of patent for non-user; the complications of legal process as regards references, re-references, and applications to examiners, Crown law officers, the Lord Chancellor, &c.; as also the absence of any reduction in the deferred stamp duties at the third year (£50), seventh year (£100); and the imposition of an additional stamp duty of £100 at the twelfth year.

The details of the new Bill having been already presented to the notice of the members of the institute in the pages of its journal (the Scientific Review) it is unnecessary to recapitulate them here.

The present Bill having many good points, which evidently had been imported into the measure in accordance with the views laid before the Attorney-General by the Inventors' Institute and those who have been working therewith, led the Executive Council to determine simply to oppose the bad features in the Bill and to work for its general modification and amendment.

With these views the Executive Council resolved to join a conference called by the Society of Arts which was held on the 6th of March, (adjourned to and concluded on 9th March, 1877), when Sir A. Brady, our President, Admiral Selwyn, Vice-President, Mr. F. W. Campin, the Secretary, Mr. T. Paterson, and Mr. F. H. Varley, who has so efficiently occupied the position of Chairman of the Executive Council in the absence of the president or a vice-president and other members, attended the conference, and there resulted from the action there taken that the following important resolutions were passed:

1. That this meeting is gratified to perceive that the necessity for additional Commissioners of Patents is recognised, but at the same time it desires most strongly to express the opinion that such Commissioners should be paid, the meeting being of opinion that unsalaried officials cannot be expected properly to perform the important duties required of them.

2. That no adverse report of an examiner, even with a right of appeal, ought to preclude an applicant from obtaining a patent, at his own cost and risk. And further, that reports containing opinions of Patent-office authorities ought not to be made public, but that opportunity should be given to the applicant of amending his specification, by inserting references to matters discovered by the authorities, with a definite statement of what he nevertheless claims.

3. That compulsory licenses are not desirable.

4. That sub-section 1 of clause 22 of the Bill, relating to compulsory working, ought to be omitted.

5. That the provisions of the Bill, so far as they relate to the amendment of specifications by way of disclaimer, explanation, supplement, or otherwise, and to the prolongation of the term of a patent to twenty-one years, should be extended to existing patents.

7. That with a view to avoid all obstruction to the production of inventions for public use by prohibitory taxation, the stamp duties on patents in all stages should be materially reduced, particularly in the initial proceedings, and that it is not desirable that the fees or stamp duties, levied on inventors in respect of patents for inventions in the United Kingdom, should materially differ from those in other States likely to be competitors in manufactures.

8. That all reductions of stamp duties should be made applicable to all existing patents.

9. That the three last lines of section 23 of the Bill should be omitted, viz. :—"The provisions of this section relating to a foreign patent shall extend and apply to a colonial patent (that is, a patent granted in any part of Her Majesty's dominions out of the United Kingdom)."

10. That sub-section 4 of section 23 of the Bill should be omitted, viz. :—"The patent shall cease on the cessor of the foreign patent or of such one of the foreign patents (if more than one) as first ceases."

11. That a deputation be appointed to wait on the Attorney-General with a copy of the resolutions, and in case he shall not accede to the same, then that the Chairman, or some other member of Parliament, be re-

quested to propose in committee amendments, in conformity with the resolutions.

The proceedings concluded with a vote of thanks to the Chairman, Major Beaumont, R.E., M.P.

The Executive Council considered that this was not all that ought to be done, and accordingly Admiral Selwyn was asked to prepare a petition to the House of Commons of similar tenor and effect to the above resolutions.

This has already been printed in the journal (April number), to which those who are desirous of obtaining a full statement of it are referred.

Various conferences of the council and members of the institute have been held on the Patent Question, which have resulted in the conclusion that it was desirable that the views of the institute should be formulated as an Amended Bill, which Admiral Selwyn, Vice-President, kindly undertook to prepare, and the same has been published in the May number of the journal as its principal article.

The present position of the Bill is this :—

Although frequently placed on Orders of the Day of the House of Commons it has not yet been proceeded with, and everyone feels doubtful whether it will be passed this Session.

Turning from the great question of Patent Law Reform, we pass to the other business of the Institute, the most prominent being the Members' Meetings. We have to remark that these have been quite equal to the average. The papers read were as follow :—

By Mr. J. J. Nickoll, "On Signalling the Course of Vessels at Sea by the Movements of the Helm."

By Mr. Hough, "On a Plan for Raising Sunken vessels from Deep Water."

By M. Camille Espir, "On a New Explosive Compound."

By Dr. Macdonald, F.R.S., "On the Purification of Buildings by Improved Ventilation and Smoke Arrangements."

By Mr. Carl Peterson, "On Arrangements for Registering Revolutions of the Steam Engine."

The number of papers was minimised by the necessity the Council felt to exist that the time and attention of the Institute should as far as possible be devoted to the Patent Law question; hence many evenings that would otherwise have been occupied by reading papers and taking discussions thereon have been devoted to the Patent Law. All these papers, however, have been noteworthy; that by Mr. Nickoll was very interesting, and was delivered to a crowded meeting; that by Mr. Hough, which was delivered on the same evening, was also the subject of much interesting discussion. In fact, this meeting obtained much notice in the daily press, the *Standard*, in particular, remarking in terms of approbation upon the good work the Institute was doing by the practical consideration and discussion of Inventions at its meetings. The Executive Council therefore propose that the thanks of the General Meeting be given to the readers of all the papers above mentioned.

Under the new rules you have now to elect *one-third*, that is, *four* members of the Executive Council, who retire by rotation, but are eligible for re-election.

The accounts have been prepared by the accountant; and audited by the two gentlemen elected, whose statement will be laid before you.

The total number of members is now about 500. We trust that the members will see that the great work the Institute is doing is worthy of their support; and that this work cannot be carried on without monetary assistance. The Council therefore hope that all members will punctually pay up their subscriptions; and that they will endeavour to bring other persons interested in inventions to support the Institute by becoming members.

This report, having been read, was then received and adopted.

The balance-sheet, as prepared by the accountant, and audited by Messrs. J. P. Cutts and W. Smartt, the auditors, was then read by the Secretary, received, and passed.

[This balance-sheet can be inspected by any member on application to the Secretary.]

This Report having been read, the President moved its reception, which, being seconded by Mr. Blanchett, was carried unanimously.

The balance sheet audited by the two gentlemen appointed by the Executive council, as stated in the Report was then put in, and on the motion of the President, seconded by Mr. Blanchett, the same was adopted.

Mr. Campin then proposed that Sir Antonio Brady be re-elected President of the Institute, and in doing so pointed out that Sir Antonio had been no mere ornamental head of the Institute, but an energetic and persistent worker in the inventor's cause, always ready to do anything for it, and constantly working for its prosperity.

Dr. J. McGrigor Croft seconded this motion, and Mr. A. J. Murray supported it. It was carried unanimously.

Sir Antonio Brady expressed his willingness to resume the office, and made some remarks as to the course he had taken to promote the objects of the Institute, especially as regarded the Patent question, in which he owned himself much indebted to the valuable assistance of Admiral Sir J. H. Selwyn. (Cheers.) He thought that they now knew enough of him to understand that when he undertook any office, he meant, as far as health and opportunities would allow, to perform the duties of that office. He begged to thank the members for re-electing him to the post of President.

The Chairman then moved, and Mr. A. J. Murray seconded, and it was carried unanimously that the Vice-Presidents of last year be re-elected, omitting the name of the Hon. Algernon Egerton, who had signified that as he held office under the Government which had now the Patent Bill before the House of Commons, he deemed it desirable that he should not be officially connected with the Institute.

The President then moved, and Mr. F. H. Varley seconded, and it was carried unanimously, that Mr. F. W. Campion be re-elected to the office of Secretary for the year ensuing.

The President moved, and Mr. Cutts seconded, and it was carried unanimously, that the vacancies in the Executive Council be now filled up, so that the list should stand as follows :—

The President.

The Vice-Presidents, see list hereafter given, the Secretary, and as elected members Dr. J. McGrigor Croft, H. A. Allardyce, Blanchett, S. Calley, J. M. Croft, Captain Fairholme, R.N., D. J. McLauchlin, T. Morgan, A. J. Murray, T. Paterson, F. Ransome, M. Zingler, F. H. Varley.

It was then moved by Mr. F. W. Campin, seconded by Mr. Murray, and carried unanimously, that the present General Council be re-elected, with power to the Executive Council to add to number of the members of General Council.

Mr. F. H. Varley proposed, Mr. T. Morgan seconded, and it was carried unanimously, that the present *Auditors* be and are hereby appointed Auditors for the ensuing year.

It was resolved, on the motion of the President, seconded by Mr. Blanchett, that it be an instruction to the Executive Council that the consideration of the financial arrangements of the Institute be the first business at their next meeting.

A special vote of thanks for the able assistance given by Admiral J. H. Selwyn to the operations of the Institute was then moved by the President, and seconded by Mr. Blanchett, and carried unanimously.

A special vote of thanks was then passed to the Auditors, Messrs. J. P. Cutts and Walter Smartt.

Also votes of thanks to the
President,
Vice-Presidents,
Secretary, and
Executive Council.

With the acknowledgment of these votes the proceedings terminated.

The list of office-bearers now stands as follows :—

COUNCIL :

Sir Antonio Brady, President of the Institute.

Note.—The Executive Council consists of the President, Vice-Presidents of the Institute, and the members whose names are marked * in the following list, those names not so marked being members of the General Council simply.

VICE-PRESIDENTS.—*The Right Hon. the Earl of Caithness; *Sir Thomas Fairbairn, Bart.; *Beresford Hope, Esq., M.P.; *His Grace the Duke of Manchester; *Robert Richardson, Esq., C.E.; *Admiral Jasper Selwyn, R.N.; *Sir Fothergill Cooke; *Cromwell F. Varley, Esq., F.R.S., &c.; *Henry Bessemer, Esq.; *C. Williams Siemens, Esq., C.E., D.C.L., F.R.S.; and Messrs. *F. H. Varley, C.E., F.R.A.S.; *H. A. Allardyce; Alexander Allan, C.E.; P. W. Barlow, C.E., F.R.S.; *W. H. Barlow, C.E., F.R.S.; *T. Blanchett; M. P. W. Boulton; *S. Calley; *F. W. Campin, F.R.S.L., (Sec.); Samuel Chatwood; D. K. Clarke, C.E.; Dr. Robert H. Collyer, F.C.S.; Samuel Courtauld; H. C. Coulthard, C.E.; *Dr. J. McGrigor Croft; Robert Davison, C.E.; William Dempsey, C.E.; *Captain Fairholme, R.N.; John S. Farmer; J. Faulding, C.E.; C. Finzel; H. A. Fletcher, C.E., F.R.A.S.; G. W. Hemans, C.E.; W. T. Henley; Alexander Mitchell Innes; Dr. H. C. Jennings; Dr. P. W. Latham, M.A.; Edward Lord; *D. J. McLauchlan; Walter Macfarlane; Colin Mather; John Mackintosh; *Thomas Morgan, A.S.E.; George Frederick Muntz; *A. J. Murray, C.E.; A. Normandy; *T. Paterson; W. H. Preece, C.E.; T. W. Rammell; John Ramsbottom, C.E.; *Fred. Ransome, C.E.; John Saxby; A. Sedley; E. Sonstadt; A. Sweet; Berger Spence; Robert Wheble; Hume Williams; W. N. Wilson; *M. Zingler.

*SECRETARY.—F. W. Campin, Esq.

AUDITORS.—Messrs. J. P. Cutts and Walter Smartt.

THE INVENTOR'S INSTITUTE,

4, ST. MARTIN'S PLACE, TRAFALGAR SQUARE, LONDON.
ESTABLISHED 1ST MAY, 1862.

Past Presidents :

SIR DAVID BREWSTER, K.H., LL.D., F.R.S., &c., from the establishment of the INVENTORS' INSTITUTE, till his decease, February, 1868. LORD RICHARD GROSVENOR, M.P.

President, SIR ANTONIO BRADY.

SESSION 1876-77.

MEMBERS' MEETING AT 8.15 P.M.

Thursday, 14th May (postponement from 7th May).—"On Indicating Correct Time throughout a Building by concurrent operation of one Standard Clock Mechanism." By G. E. Pritchett, Esq. Models of several important inventions will be exhibited at this meeting. This is the last Members' Meeting for this Session.

Executive Council at 7.30 p.m.

Subscriptions are payable to Mr. G. A. STRETTON, the Receiver, 4, St. Martin's-place, S.W., who is the proper official to give receipts. F. W. CAMPIN, Sec.

N.B.—The movement for the REDUCTION OF PATENT STAMP DUTIES *is still on foot; those who wish to support it should at once communicate with the Secretary.*

Proceedings of the Institute.

EXECUTIVE COUNCILS.

No business of importance was transacted at the Executive Council on the 26th April.

At the Executive Council on 10th May, the President, Sir Antonio Brady, in the chair. After passing the minutes of the last meeting arrangements were made for the annual audit of the accounts, and as to the course of business at the General Meeting on the 24th May. Afterwards the position of the Patent Question in Parliament was considered, when the Council merged in the Members' Meeting, and it was decided that at present no action could be taken with any good effect.

The Executive Council met on 24th May, previous to the Annual General Meeting, the President, Sir ANTONIO BRADY, being in the chair. After the Minutes of the last meeting had been passed, the Secretary reported that nothing new had transpired in regard to the Government Patent Bill, and that the general opinion seemed to be that the state of business in the House of Commons would prevent its passing this Session.

The Executive Council then proceeded to consider the Draft Report to the Annual Meeting, prepared by the Secretary, this as revised, is given in the account of proceedings at the General Meeting in another column.

The Annual General Meeting took place on the same day.

MEMBERS' MEETINGS.

At the Members' Meeting on 26th, F. H. Varley, C.E., F.R.A.S., chairman, E.C. In. Inst., presiding, Dr. J. D. Macdonald, F.R.S., Deputy Inspector General, R.N., Professor of Naval Hygiene, Army Medical School, read his paper on the "Purification of Buildings by Ventilation, and Freeing Chimneys from Smoke." This paper is given, with illustrations, in another column. After the reading of the paper a discussion ensued, in which the chairman remarked on the great importance of the subject, which he thought all present would agree with him in saying had been most ably and exhaustively treated by Dr. Macdonald.

Mr. WALLER said that having had much practical experience in matters of heating, warming, ventilating, and smoke dispersion, he felt some difficulty as to the advantage of this invention in regard to chimney tops, for though the arrangement might succeed for ventilating shafts, it by no means followed that it would succeed for chimney purposes.

Dr. MACDONALD said the invention had been tried at Netley, and no complaints had been made.

Mr. THICKE, as an Architect, would remark that although he should think the invention would prove successful when applied to large buildings; yet he felt some doubt as to its applicability to ordinary houses.

Mr. LANDAU, at the invitation of the chairman, gave a description of his invention, a description of which will be found in another column. After some further remarks from various gentlemen present, F. W. CAMPIN, the Secretary, proposed, and Mr. T. Morgan seconded a vote of thanks to Dr. Macdonald, which was passed with acclamation. A vote of thanks to the chairman terminated the proceedings.

The proceedings at the Annual General Meeting of Members on the 24th May, are given in another column.

Monthly Notices.

A Burns Fund is being raised for the erection of a statue to the memory of that poet, in Kilmarnock, for which object we hear that upwards of £1,400 has been subscribed.

The Torpedo Question has received much attention from T. BRASSEY, ESQ., M.P., (no mean authority), who has published some views worthy of serious consideration in the *Times*.

The Comptes Rendus of the Academy of Sciences, for the 23rd of April, is devoted to the prizes decreed by the Académie for the year 1876, and to tables of the prizes proposed for the years 1877 to 1883, occupying altogether upwards of ninety pages.

The Drapers' Company, following the excellent example of the clothworkers, has made a grant of £1,000 to the Society of Arts for the promotion of technical instruction by lectures; and they also offer prizes to the value of £50 to those who, having attended the lectures, shall pass good examinations.

Important contributions by French scholars on the literature of the well-known book, "Kalilah and Dimna," are expected in the course of the year. M. Carrière announces a French translation of the Syriac text, according to the Pehlvi text, edited lately by Prof. Bickel, with a German translation. M. Joseph Derembourg, member of the Institute, is preparing for the publication of the two known Hebrew translations of it, viz., that by Jacob ben Eleazar, a MS. in the Bodleian Library, and the anonymous one, a MS. in the National Library at Paris. Of the latter, some parts have already been published by M. de Sacy and by Dr. Neubauer. Finally, M. Renan, together with M. Gaston Paris, both members of the Institute, will give, in the twenty-eighth volume of the "Histoire Littéraire de la France," a minute account of Raymond de Béziers' French translation of "Kalilah," based, as it seems, on a Spanish translation.

The Admission of Women to Medical Degrees at the London University, under Mr. Cowper Temple's Act, which enables it to do so without a new charter, has caused the doctors to be troubled in their minds about the probable results of the measure. We understand that some of the faculty, headed by Dr. Quain, have adopted the sensible determination of opening the other professions also, so as not to encourage undue competition for medical honours. Others, however, are still hoping to turn the tide, and 250 medical graduates of the University have signed a memorial to the Senate praying them to rescind their resolution. This retrograde movement it was agreed should be proposed by Sir W. Jenner; the Senate to decide between owning that its former resolution was a mistake and going boldly forward. The matter will have to be discussed in Convocation, and it is expected that a division will be taken, and that an unusually large number of graduates will record their votes.—*Athenæum.*

The Wigan Mining School has, for many years, been quietly, but effectually, imparting a knowledge of those branches of science which bear on the practice of coal-mining to the young miners of Lancashire. It was announced at the annual meeting, held on Monday, the 16th of April, that upwards of £7,000 had been subscribed towards the erection of a new building, and that, (the plans being approved by the Science and Art Department), they had obtained the government grant of £1,000 in addition. £18,000, Mr. Alfred Hewlett stated, would be required; but he felt certain this sum would be obtained for the good cause of advancing coal-mining by the aid of science,

Technical Education in the City has taken another step forward during the past month, a very interesting exhibition of inventions connected with shipping, being opened by the Shipwrights' Company, at the Hall of the Fishmongers' Company, (a rich and important Guild) which has heartily co-operated in this undertaking. Prizes are offered, the freedom of the Shipwrights' Company being amongst them. The affair is highly praiseworthy, and we hope the Fishmongers will hereafter have an exhibition and prizes for fishery, fish-preserving, and other matters and inventions connected with fishmongery.

The veteran Spanish poet, Don José Zorilla, lately read before a select company of nearly two hundred members in the Madrid Athenæum, some stanzas from his Epic, "The Cid." He has had this poem in hand many years, but, as he desired that the subject should be treated with becoming dignity and vigour, the manuscript has remained long under revision. The publication of this, the poet's *magnum opus*, will be at once proceeded with.

THE SCIENTIFIC REVIEW
AND
Scientific and Literary Review.
A RECORD OF PROGRESS IN
ARTS, INDUSTRY, AND MANUFACTURES,
INCORPORATING THE
JOURNAL OF THE INVENTORS' INSTITUTE.

MAY 1, 1877.

OUR SCHOOL SYSTEMS AND PRACTICAL EDUCATION.

In a former number of the Scientific Review (December, 1876), we discussed the subject of Education and Schoolboardism. We now continue the same subject in a wider sense, that is, with reference to practical education in general.

Taking true education to mean the development of the faculties of each individual so that he may in after-life be able to give the utmost effect to any powers and bent of mind he may possess, we are bold enough to assert that the systems, or rather *curriculum* of education, so called, both in manner and kind, cannot prove of any very great advantage to the majority of the children of this country, and we opine that anyone who will calmly consider all the facts of the case will be ready to admit this. For let us fairly enquire what our systems of education are, and we shall find them to be processes of cramming into the brain a knowledge of words, and some elementary ideas of some of the branches of knowledge usually considered as parts of an educational course. For example, to take the case of what is termed a plain education—reading, writing, arithmetic, grammar, geography, history, and so forth. Now, all these things are of no mean value, and some of them—such as reading, writing, and arithmetic—we should not be foolhardy enough to deny a position which would give them almost the effect of necessities of life amongst a civilized people; and as to the others, we would by no means dispute their value. But although to be a grammarian is an excellent thing, and to be well versed in geography and history a most desirable thing, yet, looking at the fact that all opportunities of making oneself acquainted with these branches of knowledge are not cut off, because they may not have been acquired at school; and further, considering the indubitable fact that a child may grow up to be a very skilful artizan, and an industrious, honest, and generally intelligent citizen, without possessing anything but the veriest modicum of knowledge of such things, they cannot be deemed necessaries of life, but must be placed amongst its intellectual luxuries; though in the present march of knowledge it must be admitted that they are closely allied to necessaries, though not falling absolutely into that category, and the fact that for some persons these branches of knowledge stand in a different position to other persons, will in no measure alter the case as regards the great majority of people.

The fact is that, after a child has been taught to read and initiated into the mystery of manipulating figures, he will, as soon as he is introduced into some position in life where he finds use for his learning, go on to learn more and more, and in a much more practical manner than ever he did, or will, at school; moreover, if only reasonable encouragement be accorded to him, he will enter upon the acquisition of such branches of human knowledge as he may find himself to have aptitude for; whereas, if he be kept at school and made to acquire some familiarity with branches of knowledge he has a distaste for, yet he will never obtain any real knowledge, and will have simply misappropriated time which could have been advantageously devoted to other things. It may be desirable that scions of the upper, classes should pass long years at school and college, since they can be spared from the office, the counting-house, or the workshop but for all the other classes that plan is wasteful and objectionable, and in most cases it is by no means equal in real educational effect to sending a youth early to the business of life, and offering him reasonable time and inducements to pursue at educational institutions such, for example, as the Birbeck, any courses of study that he may find suited to him, and likely to advance him in the walk of life he has to pursue. The mansion-like buildings upon which ratepayers' money is now lavished, and the kind of education it is desired by our educational wiseacres to be carried forward therein, will, in a great measure, be found to be simple waste and extravagance, whereas such institutions as above referred to reasonably endowed and encouraged would most certainly advance real practical education.

The truth is, Education is the word of the day, and people utter it who have no more notion of its real meaning than the most untutored savage; in point of fact, it is very likely that the savage would have truer notions of its meaning than many of our professed advocates of education, for the savage would seek to train a man for useful action in after-life by instruction in regard to matters which would be sure to have that effect, whereas, our educationalists generally desire to afford instruction in such things as they have settled in their minds as being of primary importance; hence it has come to pass that we have established an elaborate system of elementary public schools that attempt to carry the work of education far beyond what is elementary, on subjects that will never be of any great practical use to one child in a thousand, and at the same time we make no adequate provision for youths upon leaving school being able to devote themselves to the continuance of their education,—a time when their minds are more ready to acquire knowledge than at an earlier period of their lives. What is most wanted is the provision of educational institutions for our youths, the curriculum of which shall tend to impart sound knowledge on scientific and practical subjects, so that useful information available in the practice of arts and trades, and generally advantageous to the mind, may be obtained, and a system adopted which shall cause our youths to avail themselves of the advantages of these institutions. In short, for the want of a better term Technical Schools and Colleges, are the great desiderata, and we feel assured that the adoption of such educational arrangements as these will do more good than driving all the children into school, and as now seems to be thought a fine point of discipline by our very learned London School Boardists flogging learning into them when they get them there.

Proceedings of Societies.

ROYAL INSTITUTION.

MAY 1st.—*Annual Meeting.*—W. Pole, Esq., V.P., in the chair.—The Annual Report of the Committee of Visitors for the year 1876 was read and adopted. The real and funded property now amounts to above £84,000 entirely derived from the contributions and donations of the Members. The following gentlemen were elected Officers for the ensing year:—*President*, The Duke of Northumberland; *Treasurer*, George Busk; *Secretary*, W. Spottiswoode; *Managers*, G. Berkley, W. Bowman, Admiral Sir H. J. Codrington, Warren De la Rue, E. Frankland, F. Galton, F. Du Cane Godman, C. H. Hawkins, T. H. Hills, A. Latham, J. C. Moore, W. Pole, Sir W. F. Pollock, Lord Rayleigh, and Lord Arthur Russell; *Visitors*, J. R. Andrews, J. F. Bateman, T. Boycott, J. C. Burgoyne, A. J. Ellis, W. W. Lloyd, V. Pushington, Sir C. H. Mills, Bart., W. Newmarch, Col. W. Pinney, Rev. A. Rigg, B. W. Smith, T. Sopwith, G. A. Spottiswoode, and Sir H. Verney, Bart.

May 7th.—G. Busk, Esq., Treas. and V.P., in the chair.—The following Vice-Presidents for the ensuing year were announced: Admiral Sir H. J. Codrington, Warren De la Rue, Esq., Lord Arthur Russell, G. Busk, Esq., and W. Spottiswoode, Esq. Mrs. J. Farmer, Miss C. Alethé Fry, Major-General Sir T. T. Pears, Messrs. C. J. Lacy, jun., W. A. Mackinnon, F. Ricardo, and a Williams, were elected Members.

ROYAL SOCIETY.

APRIL 19TH.—Dr. Hooker, President, in chair. The following papers were read:—"On Putrescent Organic Matter in Potable Water," by Prof. G. Bischof,—"On a Cause for the Appearance of Bright Lines in the Spectra of Irresolvable Star Clusters," by Mr. E. J. Stone,—and "On Some Figures Exhibiting the Motion of Vibrating Bodies, and on a New Method for Determining the Speed of Machines," by Prof. H. M. M'Leod and Lieut. G. S. Clarke.

April 26th.—Dr. Hooker, President, in the chair. The following papers were read: "On the Nature and Origin of Beds of Chert in the Carboniferous Limestone of Ireland," by Mr. E. Hull,—"Researches on Emeralds and Beryls," Part II., "On some of the Processes employed in the Analysis of Emeralds and Beryls," by Mr. G. Williams,—"Preliminary Note on the Otheoscope," by Mr. W. Crookes,—and "On the Inferences to be drawn from the Appearance of Bright Lines in the Spectra of Irresolvable Nebulæ," by Mr. W. Huggins.

SOCIETY OF ARTS.

APRIL 19TH.—F. A. Abel, Esq., in the chair.—The paper read was, "On Spontaneous Combustion in Factories and Ships," by Mr. C. W. Vincent.

April 20th.—General Cotton in the chair.—The paper read was, "On Communications between Persia and India," by General Sir F. Goldsmid.

April 24th.—Admiral Ommanney in the chair.—The paper read was, "On the Resources of Morocco," by Dr. A. Leared.

April 25th.—Gen. Cotton in the chair.—Nine new members were proposed for election. The paper read was entitled, "Deaf, not Dumb," by Mr. B. St. John Ackers.

April 26th.—Mr. W. Hartley in the chair. The paper read was "On Phosphor Bronze and its Applications," by Mr. A. Dick.

May 2nd.—Lord Aberdeen in the chair. Ten new Members were proposed for election. The paper read was by Capt. Tyler, "On Continuous Breaks for Railways."

May 4th.—Sir W. Fayrer in the chair.—The paper read was "Thaumato-dendra, or Wonders of Trees," by Mr. W. Tayler.

May 9th—Rev. J. Clutterbuck in the chair.—Three new Members were proposed for election.—The paper read was "The Artesian System of the Thames Basin," by Mr. J. Lucas.

INSTITUTION OF CIVIL ENGINEERS.

APRIL 24TH.—Mr. G. R. Stephenson, President, in the chair.—The following papers were read: "On a Deep Boring for Coal at Scarle, Lincolnshire," by Prof. E. Hull; and "On Street Tramways," by Mr. R. Souttar.

May 1st.—Mr. G. R. Stephenson, President, in the chair. Sixteen candidates were elected, of whom six were Members, viz.: Messrs. H. Bramall, J. G. T. Coddington, E. B. Forbes, J. Golding, F. C. Liddell, and R. C. Patterson; and ten Associates, viz.: Messrs. E. W. Brooking, A Grant, A. Latham, R. D. M. Littler, A. D. Moullin, J. A Mously, W. P. Oak, C. H. Shortt, J. J. Tylor, and H. Wilmer.

May 8th and 15th.—Mr. G. R. Stephenson, President, in the chair.—A paper by Sir G. W. Armstrong, "On the History of the Modern Development of Water-Pressure Machinery," was read.

SOCIETY OF ENGINEERS.

MAY 7TH.—Mr. T. Cargill, President, in the chair.—The following gentlemen were elected as Members: Messrs. F. J. Rowan, E. Keppler, E. Addenbrooke, W. H. Thelwall, F. W. Hall; and Messrs. F. G. Brown, F. Sayers, and E. H. Toulmin, as Associates. A paper was read by Mr. P. R. Bjorling, "On Direct-acting Pumping Engines."

CHEMICAL SOCIETY.

APRIL 19TH.—Dr. Gladstone in the chair.—The following papers were read: "On the Estimation of Manganese in Spiegeleisen, and of Manganese andIron in Manganiferous Iron Ores," by Mr. E. Riley. For estimating manganese in spiegeleisen the author recommends the indirect method, *i.e.*, estimating the iron, adding 5 per cent. for impurities, and taking the difference as manganese, for accuracy and rapidity; for estimating manganese in ores, the author prefers to separate the iron as basic peracetate with carbonate and acetate of ammonia, and precipitate the bromine and ammonia, taking care that the ignited precipitate contains no baryta, zinc, or lime. For the estimation of the iron, a standard solution of bichromate of potash yields the best results, the iron being reduced with pure sulphite of soda.—"On a Method of Detecting Small Quantities of Bismuth," by Mr. M. M. P. Muir. The author proposes a liquid (Schneider's reagent) consisting of a clear solution of twelve grammes of tartaric acid and four grammes stannous chloride in caustic potash. One part of bismuth in 210,000, if warmed to 60-70° C., with this reagent gives a brownish colour.—"On Certain Bismuth Compounds," by Mr. M. M. P. Muir. This paper gives an account of the preparation, properties, and reactions of the ferricyanide of bismuth.—"Notes on Madder Colouring-Matters," by Messrs. E. Schunck and H. Rœmer. Munjistin: this substance resembles purpuro-xanthic acid in its physical properties. Purpurin: a pure specimen was examined, and its properties are given. Alcoholic lead acetate gives, with purpurin dissolved in alcohol, a precipitate soluble in excess; with alizarin, a precipitate insoluble in excess. Triacetyl purpurin and brompurpurin were prepared and analysed by the authors. By heating pure purpurin in sealed tubes to 300° C., it was found to be partially converted into quinizarin.

May 3rd.—Dr. Gladstone in the chair. The Treasurer announced that £1,000 had been placed to the credit of the Society by the son of the late Mr. Lambert. The following papers were read: "On some Points in Gas Analysis," by Mr. J. W. Thomas. The author finds that nitric oxide is absorbed by caustic potash and pyrogallic acid, and recommends that a known volume of pure oxygen should be introduced after the absorption of carbonic acid, and any decrease of volume noted as nitric oxide. He states that an excess of caustic potash should always be present in the alkaline pyrogallate, but that too much of the latter should not be used. "On the Decomposition of Nitric Oxide by Pyrogallate of Potash," by Dr. Russell and Mr. W. Lapraik. The authors state the probable action of the above reagent is to convert nitric oxide into half its volume of nitrous acid, but that simultaneously another more obscure reaction takes place, so that fifty-eight to seventy-six per cent. of the gas is absorbed instead of fifty per cent. "Contributions to the History of the Naphthalene Series: No. I. Nitroso-β-Naphthol," by Dr. Stenhouse and Mr. Groves. Nitroso-β-naphthol was obtained by the action of nitrosyl sulphate on β-naphthol, and purified by conversion into a barium compound, &c. It crystallizes in brilliant hydrated yellow needles or anhydrous orange-brown plates or prisms. It melts at 109 5°. By treatment with dilute nitric acid, mono-nitro β-naphthol is obtained. By acting on the barium compound of nitroso-β-naphthol with hydrogen sulphide a precipitate is formed, which, by the action of potassium dichromate, is converted into β-naphtha-quinone, melting at 96°; this substance is interesting as being the first instance of two isomeric quinones derived from the same hydrocarbon. "On Asbestos Cardboard, and its Uses in the Laboratory," by Mr. W. N. Hartley. This substance resembles thick greyish cardboard formed principally of asbestos fibres; it can be cut or moulded (by moistening with water) into any shape, and is extremely useful for crucible supports, muffles, &c.

GEOLOGICAL SOCIETY.

APRIL 11TH.—Prof. P. M. Duncan, President, in the chair. Messrs. J. R. Campbell, J. Carter, W. R. Ellis, W. H. Merritt, W. Morgans, and E. A. Parsick were elected Fellows. The following communications were read: "On Sand-worn Stones from New Zealand," by Mr. J. D. Enys,—"On the Bone-caves of Creswell Crags," third paper, by the Rev. J. M. Mello,—and "On the Mammal-fauna of the Caves of Creswell Crags," by Prof. W. B. Dawkins.

April 25th.—Prof. P. M. Duncan, President, in the chair. Messrs. S. Bewsher, H. G. Bolam, C. Thomas, and J. M'Kenzie Knight, were elected Fellows. The following papers were read: "On the Upper Limit of the essentially Marine Beds of the Carboniferous System, and the necessity for the Establishment of a "Middle Carboniferous Group," by Prof. E. Hull,—and "On Coal-Pebbles and their Derivation," by Mr. H. K. Jordan.

May 9th.—Prof. P. M. Duncan, President, in the chair.—Rev. E. R. Lewis, Messrs. J. Dorrington, E. Penton, jun., H. Rosales, and H. White were elected Fellows. The following communications were read: "On the Agassizian genera, Amblypterus, Palæoniscus, Gyrolepis, and Pygopterus," by Dr. R. H. Traquair,—"On the Circinate Vernation, Fructification, and Varieties of *Sphenopteris affinis*, and on *Staphylopteris* (?) *Peachii*, Etheridge and Balfour, a Genus of Plants new to British Rocks," by Mr. C. W. Peach,—"On the Occurence of a Macrurous Decapod (*Anthrapalæmon Woodwardi*, sp. nov.) in the Red Sandstone, or Lowest Group of the Carboniferous Formation in the South-East of Scotland," by Mr. R. Etheridge, jun,—and "On the Stratigraphical Position of the Corals of the Lias of the Midland and Western Counties of England and of South Wales, by Mr. R. F. Tomes.

PHYSICAL SOCIETY.

APRIL 28TH.—Prof. G. C. Foster, President, in the chair.—Mr. W. Ackroyd described some methods of studying selective absorption in relation to the doctrine of aggregation. Prof. H. M'Leod exhibited several forms of apparatus which he has, in conjunction with Lieut. G. S. Clarke, R.E., arranged for determining the speed of machinery, &c., from observations made on the figures produced by combining their motion with that of of a vibrating body. A description of them has already been communicated to the Royal Society.

ZOOLOGICAL SOCIETY.

April 17th.—O. Salvin, Esq., in the chair. —The Secretary read a Report on the additions to the menagerie during March, and called particular attention to a collection of rare Himalayan Passeres, purchased March 8th, embracing examples of several ornamental species new to the Society's collection, and two young male Orang-outangs (*Simia satyrus*), presented March 13th by Dr. R. Sim. He also exhibited and made remarks on some young Anacondas produced dead by the large female Anaconda purchased on the 15th February,—and exhibited photographs of the young Gorilla in the Berlin Aquarium, and made some remarks on what, it now seemed certain, was an example of this ape, which was formerly living in one of Wombwell's travelling menageries, and was after its death transferred to the late Mr. C. Waterton's collection. Letters and papers were read from Mr. W. A. Willes, on the endeavours of the Acclimatisation Society at Christchurch to introduce salmon into New Zealand from the United States,—from Mr. W. A. Forbes, on the peculiar organ known as the *Bursa Fabricii* in birds, and of its variation and modifications in the different genera of the class which he had an opportunity of examining,—from M. L. Taczanowski, on the birds collected in North-Western Peru in 1876 by Messrs. Jelski and Holzmann; amongst several new and interesting forms described was a new genus and species of Fringillidæ, proposed to be called *Gnathospiza Raimondii*, — from the Rev. R. B. Watson, on the Maderian mollusk identified by the Rev. R. T. Lowe as *Achatina folliculus*,—from Mr. E. P. Ramsay, containing the concluding portion of his list of birds met with in North-Eastern Queensland, chiefly at Rockingham Bay,—from Dr. O. Finsch, on the birds collected during his recent journey in the north-eastern part of Turkestan,—from Professor Owen, on a new species of extinct Kangaroo of the genus Sthenurus, which he proposed to call *S. minor*, together with some remarks on the relation of this genus to Dorcopsis, —by Mr. E. A. Smith, on new species of South American Helicidæ in the British Museum,—by the Marquis of Tweeddale, on four new species of birds from the Indian region; these he proposed to name as follows: *Trichostoma leucoprocta*, *Chrysococcyx limborgi*, and *Pomatorhinus Austeni* (from Tenasserim), and *Brachypteryx Burtoni* (from Sumatra),—and by Mr. O. Salvin, on a new genus and species of bird of the family Ampelidæ, from Costa Rica, and proposed to call it *Phainoptila melanoxantha*.

May 1st.—Prof. Newton, V.P., in the chair.—Papers and letters were read: by Mr. H. Saunders, who exhibited some nests and eggs of the Orphean Warbler (*Sylvia Orpheus*), from Malaga, Spain: amongst the eggs in each nest were one or two of larger size, supposed to be possibly the eggs of the Cuckoo; Mr. H. Saunders also exhibited two skins of Dupont's Lark (*Certhilauda Duponti*) from the same locality,—by Prof. St. G. Mivart "On the Axial Skeleton of the Pelicanidæ," selecting Pelicanus as his type and standard of comparison; Prof. Mivart first compared it, as regards its axial skeleton, with Struthio, and the other Struthionidæ, and then compared the other Steganopodes with it and with one another,—from Prof. M. Watson, "On the Anatomy of *Hœyna crocuta*,"—by Mr. A. G. Butler, "On two Small Collections of Heterocerous Lepidoptera, from New Zealand," recently brought to England by Dr. Hector and Mr. J. D. Enys,—from Dr. O. Finsch, giving an account of a small collection of Birds from the Marquesas Islands, amongst which were three examples of a new species of Kingfisher, proposed to be called *Halcyon Godeffroyi*,—from Mr. F. Smith, on four new species of Ichneumonidæ, in the collection of the British Museum, amongst which was a new Bracon, remarkable for having its ovipositor more than nine times the length of its body: this was proposed to be called *Bracon penetrator*, and had been received from Yokohama, Japan,—by Prof. A. H. Garrod, "On the Anatomy and Systematic Position of the Genera Thincorus and Attagis," which he considered should be referred to the Limicolæ, in the neighbourhood of Glareola and Cursorius.

HISTORICAL SOCIETY.

April 12th.—Dr. B. W. Richardson in the chair.—The chairman announced that his Majesty the King of the Belgians had joined the society as an honorary member. Among other honorary members enrolled by the council were Dr. Siegel, of Vienna; Major-General J. B. J. Liagre, Secretary of the Royal Society of Science, Brussels; Sir J. E. Alexander, C.B.; Dr. W. Jelly, of Madrid; and Mr. F. De Peyster, President of the Historical Society of New York. Eight ordinary members were enrolled. A paper was read by the secretary, entitled, "Lancashire in the Reign of Queen Elizabeth," by Lieut.-Col. Fishwick. Mr. H. H. Howorth read a raper "On the Early Intercourse of the Danes and Franks."

May 10th.—Dr. Zerffi in the chair.—The Chairman intimated that the King of Sweden and Norway had been pleased to accept an honorary membership. Four ordinary members were additted. Mr. J. Fisher read a paper "On Landholding in Scotland."

PSYCHOLOGICAL SOCIETY.

April 19th.—Mr. Serjeant Cox, President, in the chair.—Professor Barrett was elected an honorary member. Communications of psychological facts were read. Mr. G. Harris read a paper "On Hereditary Transmission of Intellectual Qualities." A discussion was taken on Mr. Croll's paper "On Psychology Proved by Molecular Motion," and was adjourned to the next meeting.

May 3rd.—Mr. Serjeant Cox, President, in the chair.—Mr. Massey read a paper "On Psychological Experiences," by an official of the United States Government.—A discussion was taken on Mr. Harris's paper on "Heredity."

May 17.—Annual Meeting.—Mr. Serjeant Cox, President, in the chair.—The President, Vice-Presidents, and Council were re-elected. Lord Borthwick was elected a Vice-President. A resolution was passed for the publication of the psychological facts and phenomena communicated to the Society. A discussion was then taken on the paper narrating some experiences of a distinguished American, which was again adjourned.

BRITISH ARCHÆOLOGICAL ASSOCIATION.

April 18th.—The Rev. Dr. S. Simpson in the chair.—In the absence of Mr. W. Mooney, a large collection of relics from the ancient cemetery, recently discovered at Kintbury, near Newbury, were described by Mr. Loftus Brock. This graveyard is on the slope of a chalk hill on high ground, and, although the surface is covered with fragments of Roman pottery, no relics whatever have been discovered in any of the numerous graves. It is the opinion of Canon Greenwell that the interments are of pagan Saxon date, and this was generally assented to. Mr. Money exhibited some swords found on the site of one of the battles o Newbury, and it was noticed that one o the objects was a sword-blade of sixteenth century date, which had been formed into a bayonet at the later period. Several objects of interest were exhibited, including some seals by Mr. De Grey Birch; and the Chairman described a remarkable document, recording a miracle performed in a church at Cordova upon a sick man whilst praying before an image. The document, which was signed by the Bishop of Cordova, was exhibited and it will be reproduced in the *Journal*. The Rev. Prebendary Scarth reported the discovery of Roman remains at Charterhouse, on the Mendip Hills, and sent drawings. The first paper was by Mr. C. H. Compton, "On the Ancient Forest Laws of England." The lecturer went through all the legal authorities, and gave a digest of Manwood's "Forest Law" from an early edition. The second paper was by C. W. Dymond, "On the Chymoone Cromlech and the Mên on the Tol or Holed Stone," two remarkable pre-historic monuments visited during the recent Cornish Congress. The paper was illustrated by accurate plans, which will appear in the *Journal*.

ASIATIC SOCIETY.

April 16th.—Sir E. Colebrooke, Bart., President, in the chair.—Sir D. Forsyth was elected a Resident Member.—Mr. J. W. Redhouse read a paper, in which he suggested the identity of the "zodiacal light" with the phenomenon called the "Wolf's Tail" and the "False Dawn" in Arabic, Persian, and Turkish; which are described by Orientals as being seen in the eastern sky, in the shape of a tall, slender pillar of faint light, a short time before the appearance of the "true dawn" or daybreak. "The Hebrew term," he added, for the dawn is rendered by ὄρθρος in the Septuagint which is also the name of the "two-headed dog of Geryon," killed by Hercules in his Tenth Labour. Can any connexion be traced between this "two-headed dog" (perhaps the zodiacal light of the morning and evening) that watched over Geryon's herds under the setting sun, and the "Wolf's Tail" of the Easterns? The Arabic word rendered, unequivocally, in Persian by "wolf" is also the "name of a certain dog" and of "two different horses." Do the Vedic hymns offer any clue to the solution of these myths?

QUEKETT MICROSCOPICAL SOCIETY.

April 27th.—H. Lee, Esq., President, in the chair. Four Members were elected. Communications were received from Mr. W. K. Bridgeman, "On a New Tinted Glass for Microscopical Purposes," and from the Excursion Committee, reporting the results of two field excursions. A paper was read by Mr. T. C. White, "On some Personal Observations upon Botryllus," in course of which he described certain amæboid movements which it was believed had been hitherto unnoticed in connexion with the genus.

SOCIETY OF BIBLICAL ARCHÆOLOGY.

May 1st.—C. T. Newton, Esq., in the chair.—The following papers were read: "Sur une Stèle Egyptienne du Musée de Turin," by M. F. Chabas,—"On the Sites of Chorazin, Bethsaida, Capernaum," by the Rev. Canon Ridgway,—and "On the Stèle of Tritisen in the Museum of the Louvre," by Prof. G. Maspero.

The Dictionary of Cookery, published by Messrs. Cassell, Petter, and Galpin, is now completed, and forms a standard authority on a technal work interesting to everybody. A sequel serial is to be published by the same enterprising firm.

LANDAU'S IMPROVED AUTOMATIC VENTILATORS.

Our illustration exemplifies a cowl for the exhaustion of the vitiated air or smoke, &c., and exhibits the details of its construction so that they will be readily understood. Its lower part consists of truncated cones, which are placed one over the other by distance pieces or blocks. At the top of these cones is placed a number of hollow plates or rings, which are separated from each other by distance pieces or blocks, so as to allow the current of air to pass between the plates. These plates or rings are surmounted by truncated conical caps, one over the other, and are also kept apart so as to allow a free passage of the air between the inner and outer cap. The inner cap is provided with a dome which rests on supports. The dome not only prevents down draught, but also rain, snow, and other matter from entering the ventilating shaft.

Fig. 16 represents a view of the inlet for the supply of fresh air without receiving any draught.

A tube (A), closed by a grating (B), is fixed in the outer wall for the admission of fresh air. In the tube A slides another tube (C), which is provided with a series of annular plates, similar to the Ventilating Cowl already described, and is closed at the end by a solid plate, which has on its outside a knob or handle. This arrangement allows the air to enter the room gradually, and close to the wall. As the tube C slides in the tube A, it is capable of being regulated to admit more or less air, as may be required, or to shut it off entirely. The space between the grating and the inner tube may be filled with pieces of charcoal, for intercepting any impurities.

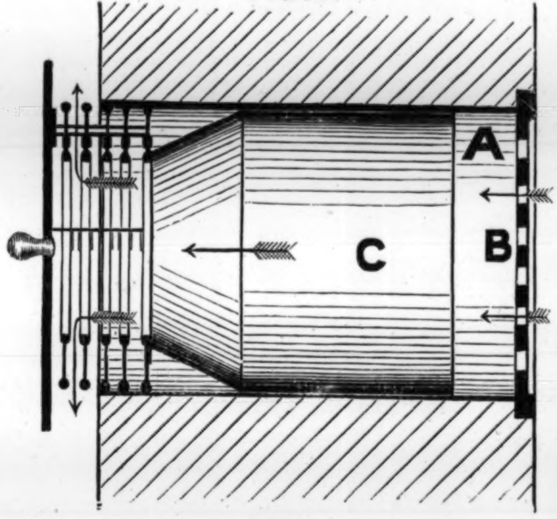
The modes of adopting the use of the Landau Automatic Ventilating Apparatus are various, and depend entirely upon where it is to be fixed, also as to what kind of buildings, structures, &c., it is to be applied, although the principle is always the same, and very simple. For instance,

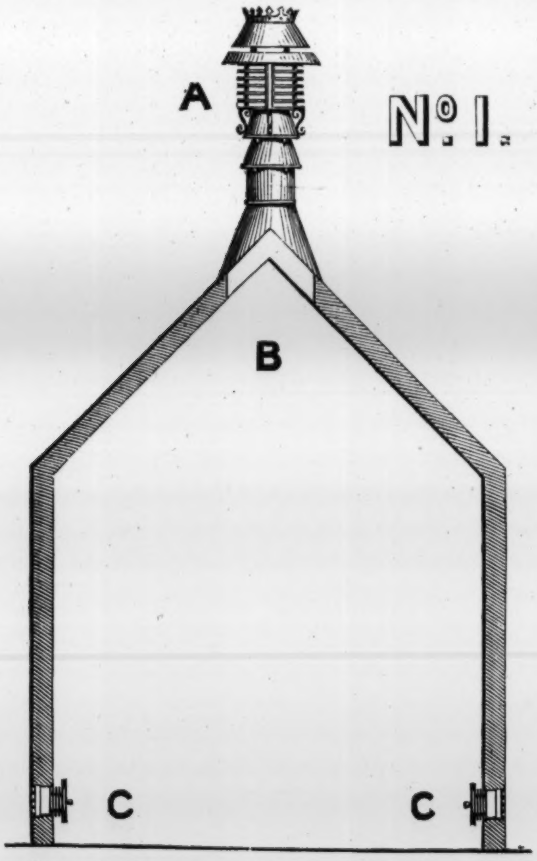
No. 1. represents a view of a structure only one storey high, as in churches, schoolrooms, theatres, halls, &c. In this instance the best plan would be to fix the ventilating cowl A in the middle of the roof B, and the inlets C for the admission of fresh air at the lower part of the building.

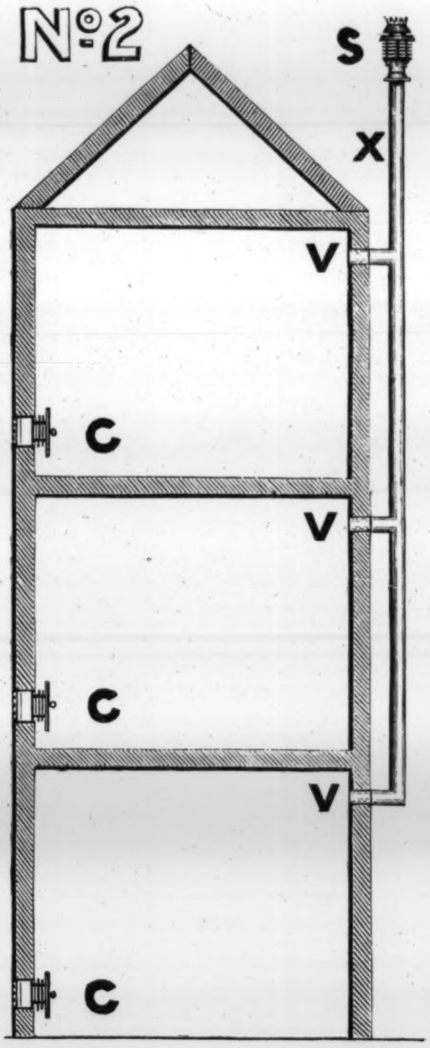
No. 2 represents a building consisting of several storeys. The best plan for adopting the ventilating apparatus, for the thorough ventilation of all the rooms, is as follows:—Each room is provided with an inlet C, for admitting fresh air at the lower part of the room. The main ventilating pipe X, which is provided with the ventilating cowl S at its top, is in communication with every room through openings V near the ceilings, which may be protected inside the room by perforated cornices, so that the whole of the vitiated air of each room passes upwards through the perforated cornices in the openings V, where it gets drawn off above by the action of the cowl. Sometimes the pipe X can be dispensed with, but then the openings V at the upper part of each room should be provided with a horizontal ventilator for the exhaustion of the vitiated air, as shown in No. 3.

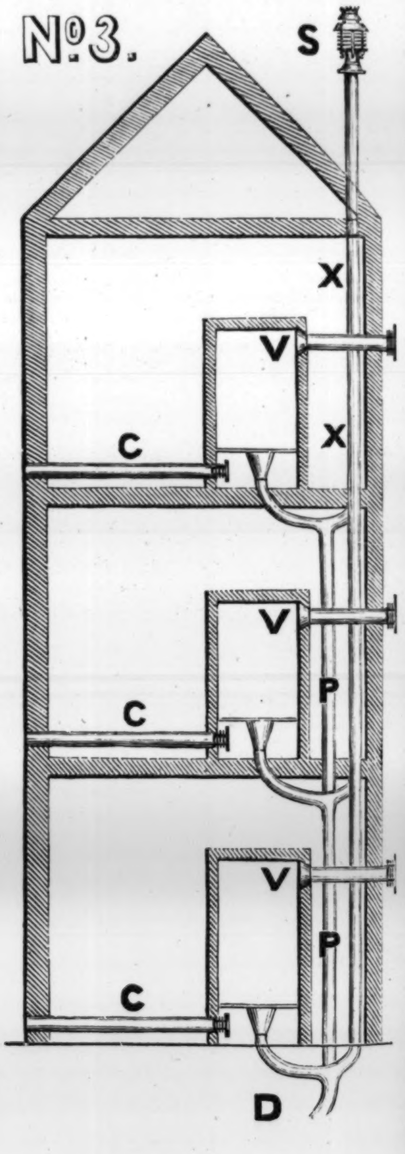
No. 3 represents a view of an arrangement for adopting the Landau Automatic Ventilating Apparatus for the purpose of venti-

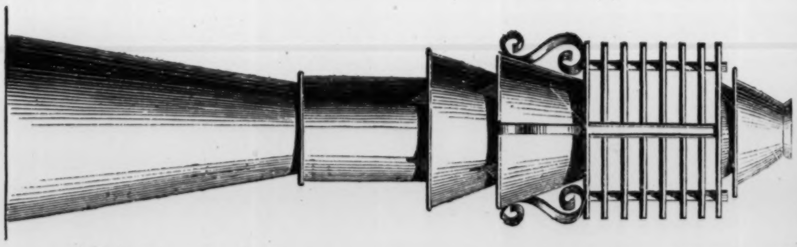
FIG 16.











lation of w.c.'s, soil-pipes, drains, etc. Every w.c. is provided with an inlet C for the admission of fresh air at its lower part. The upper part of every w.c. is connected with a horizontal ventilation V for the exhaustion of the vitiated air, and the soil-pipe P, which is connected with the drain D, is in communication with another pipe X, which is provided with a ventilating cowl S. at its top for exhausting the foul gases.

The principle of this arrangement is to cause a regular circulation of air through all communications therewith, so that all the various traps connected with house-sinks, w.c.'s, pantries, etc., are relieved of pressure from the drains; the ingress of sewer gas into the house is rendered well-nigh impossible, and it will effectually relieve overcharged drains and prevent the accumulation of stagnant gases.

The same Automatic Ventilating Cowl is successfully adapted for correcting the great nuisance of smoky chimneys, and there is no hesitation in saying that this cowl will correct the worst of smoky chimneys, which smoke from the effect of wind or in consequence of a descending current, and this will be corrected by placing the cowl on the top of the chimney shaft, where it can be easily fixed by an ordinary builder. But of course it must be remembered that sometimes it is necessary to correct the fire-grate by contracting its openings as well—not only the top of the chimney, especially when the room is badly supplied with fresh air for ventilation, which will cause the chimney-shaft to be converted into an inlet (while it ought to be an outlet only) of air into the room, and the air brings the smoke with it into the apartment. In this case it will be necessary, besides the fitting of the chimney cowl, to provide for a special and plentiful supply of fresh air to the fire-grate. The adoption of this Automatic Chimney Cowl is therefore affirmed by the inventor to be of great advantage to all who value perfect ventilation, health, comfort, and economy.

PURIFICATION OF THE AIR IN BUILDINGS BY VENTILATION AND SMOKE REMOVAL.

By Dr. J. D. Macdonald, F.R.S., Deputy Inspector of Hospitals and Fleets.

Dr. Macdonald commenced his paper, which was read at the meeting of the Inventors' Institute, on 26th April, 1877, by stating that the principles of ventilation were founded upon a knowledge of the physical constitution of the air we breathe, and he then entered fully into the consideration of the various constituents of the atmosphere, and the respiratory processes of animals and plants. As to the former, he stated that the elements essential to the respiration of animals were:—1. oxygen, by volume 20·8, by weight 23.—2. Nitrogen, 29·2, by weight 77. Carbonic acid was noticed as existing in the atmosphere as a product of combustion, respiration, and decay of various kinds, besides having a terrestrial source, as in Prymont, the Grotto del Cane, and in the coal measures under the name of choke damp. The inhalation of carbonic acid is fatal, as acting indirectly by causing spasmodic closure of the glottis, hence the use of cold affusion in cases of so called, poisoning in this way. After very fully considering the question of carbonic acid, Dr. Macdonald remarked, that as water was a necessary part of the atmosphere ammonia evolved by the putrefaction of nitrogenised organic substances, was absorbed by rain water, and thus conducted to the earth, forming part of the plant food. He mentioned that *white clay*, which is sesquioxide of iron, is found, when heated, after sufficient exposure to the air, to give out large quantities of ammonia.

Dr. Macdonald then referred to the presence of organic matters in the atmosphere, stating that there could be no doubt that the germs of infusioria and fungi are frequently very widely distributed through the realms of air, and there is good reason to believe that every shower of rain is highly charged with them. Many curious facts in connection with this subject appear to give colour to what has been denominated the spore theory, of at least, some epidemic diseases.

Strong winds often carry up dust and finely divided inorganic matter to a considerable height in the atmosphere, as also to very great distances in the horizontal direction. In illustration might be mentioned, the muddy rain of the Mediterranean, in which even new forms of Diatomaceæ were detected by Ehrenberg, and what are known as "southernly bursters" and "brick fielders," at Sydney, New South Wales, by which even coarse sandy particles are carried across the harbour in clouds, and distributed over the neighbouring country.

The infectious nature of some diseases is unquestionably due to the actual emanation of organised particles from the affected parts, as for example, from the eyes, in case of purulent opthalmia, and their consequent fortuitous deposition upon the healthy and absorbing membranes of those coming within range. The simple force of evaporation is quite enough to carry Bacteria and infusorial animalcules into the air, and owing to the same cause, even pus corpuscles have been detected in an opthalmic ward by Ersett. Dundas Thomson detected the presence of epithelial cells in the air of a cholera ward as early as 1849, and subsequently in 1854. The organic matter accumulating in ill-ventilated and neglected wards may consist of nearly 50 per cent. of epithelium and pus corpuscles.

The physics of the atmosphere afford us the leading principles of ventilation, and the ventilation of the globe itself is the grandest lesson that can be taught in this important branch of science. The beautiful scheme devised by Lieut. Maury, of the U.S. Navy, gives at once the most comprehensive and satisfactory view of the subject, which was explained at length by the lecturer. Along the equator we have a belt of calms of several degrees in width, in which the air heated and expanded under a vertical sun, becomes specifically lighter, and ascends into the higher regions of the atmosphere, and then overflowing north and south, passes over the trade winds, which flow in from either hemisphere, and descending towards the surface of the earth, in latitude about 30°, then crossing the winds coming from the poles, in what are called the horse latitudes, proceeds converging towards the poles as a surface wind, when it again ascends, and proceeding towards the equator, descends through the calms of Cancer and Capricorn, and as a surface wind forms the trade winds before referred to.

When a good current of air can be established in any fixed locality, the renewal of the contained air will thus, of course, be ensured so that if any persistent source of contamination should exist in it, the poluted air will be carried off and replaced by a fresh supply; but sometimes in our efforts to bring about a state of things like this we develope draughts or concentrated currents of air in definite directions, which are now and then attended with such bad consequences that the remedy becomes worse than the disease.

The motion of the air constituting ordinary winds is of the utmost importance as being essential to the most simple and natural form of ventilation. While considering the mode in which the ventilation of the globe we inhabit is provided for, we found that heated air having become expanded, and of lower specific gravity will take an upward course, to be replaced by colder and denser air, which will descend or pass horizontally, as the case may be, to fill up the space originally occupied, which would otherwise become a partial vacuum. This problem is thus reduced to a difference in weight in two neighbouring columns of air, as a source of motion, the lighter ascending, and the heavier descending, and of which we have great natural examples, suggesting the artificial employment of heat to effect an interchanging movement. The Punkah, the revolving fan, the Archimedian screw, and the Piston afford us the more usual means of developing an active circulation of air.

It is a question whether it may be better to force fresh air into circumscribed spaces on the plenum principle, or to attempt the removal of the foul air by extraction. There is this difference, however, that in the former case the tainted air must suffer dilution or diffusion before it can pass off, whereas, by the latter mode it is drawn up through a definite channel, and diffused in the external air. All evidence of a recent kind is in favour of extraction, as compared with propulsion, or the plenum principle, and further, that both ingress and egress must be provided for to imitate open air conditions in circumscribed spaces. If a human being were confined in a small chamber unfurnished with an opening for the ingress or egress of air at every expiration, he will expell a volume of moist warm air, deprived of much of its oxygen and charged with carbonic acid. This being in an expanded state, will first rise to the ceiling; but after a while having suffered sufficient condensation, it will commence to descend, and it is easy to perceive that the persistence of this state of things must soon bring about a fatal issue. If, however, a single opening be made in the upper part of the chamber, we only delay the process, for although diffusion is, to a certain extent, favoured in this way, if the opening is not sufficiently large the amount of foul air will steadily increase until life can no longer be sustained. Still, further if provision is made for ingress and egress by two distinct openings, a very trifling circumstance is usually sufficient to determine an up draught in one or the other. Several forms of aspiratory cowls were exhibited, and the lecturer gave a brief description of the "Twin-fan Ventilator" and the Double Ventilating Shaft.

The above appliances, in combination, form a most complete apparatus for ventilating purposes, but they require separate description, in order that the principle upon which they are constructed may be properly understood. The same references will apply to the several accompanying figures.

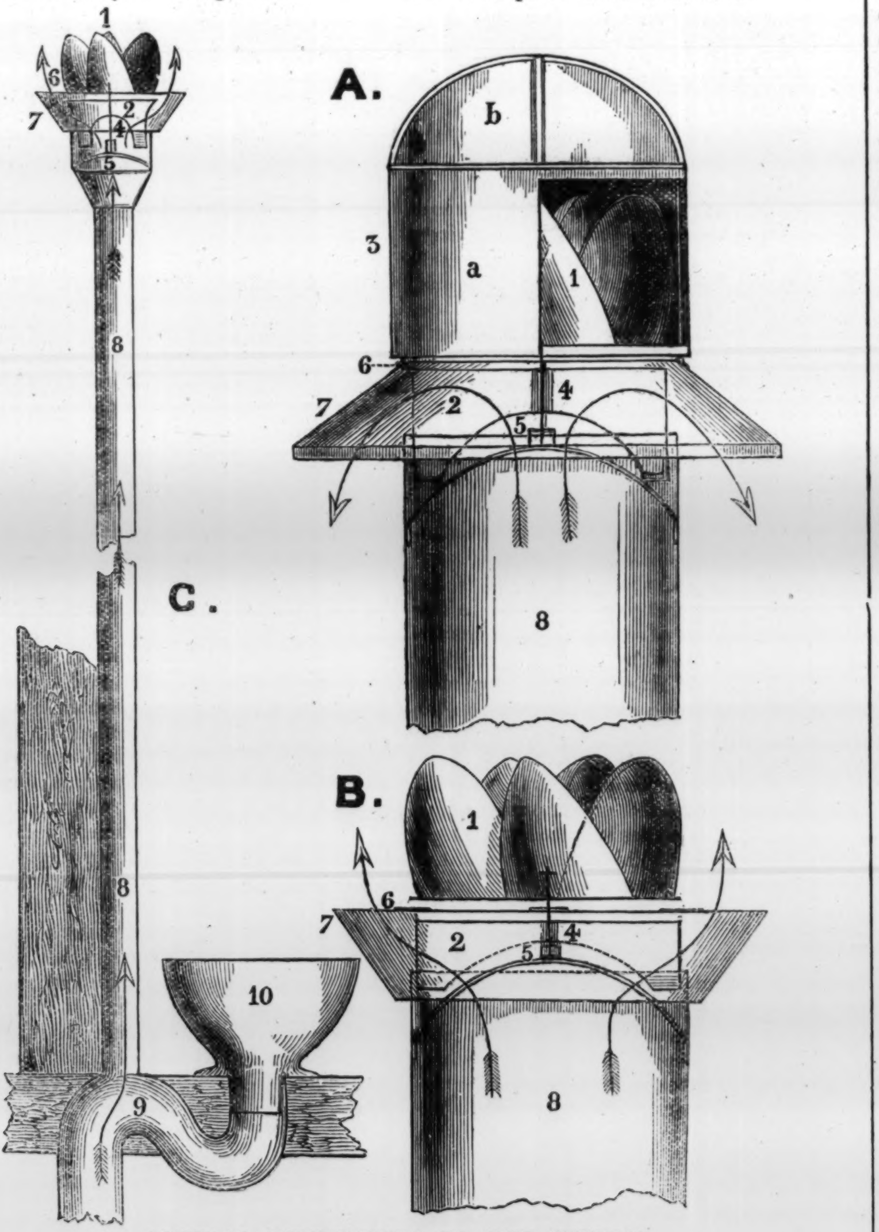
I.—Of the "Twin-Fan Ventilator."—This consists of three essential parts, viz., "Motile Fan," (1), revolving with the wind, by which motion is communicated to an "Aspiratory Fan," (2), placed beneath t on the same axis, and a "Self-Adjusting Cap," (3), so contrived as to direct the wind upon the "Motile Fan" to the best advantage.

(1)—The "Motile Fan," is composed of several concave blades or cups, upon a transverse circular plate, or fixed at equal distances round the axis. In the amount of resistance offered to the wind, the concave side of each blade exceeds the convex by about one fourth, so that motion in one direction only is determined by this difference, as in the case of the anemometers in ordinary use.

(2)—One side of the lower or "Aspiratory Fan" is turned downwards over the mouth of the air shaft, while the other side is cut off from the external air by the before-mentioned circular plate between it and the upper or "Motile Fan." The exhaustive action of the "Aspiratory Fan" is, therefore, confined to the air within the shaft, which is thus elicited and thrown off in all directions by centrifugal force.

(3)—The "Self-Adjusting Cap" is constructed with the view of still further counteracting the resistance of the convex side of the motile blades, by interrupting the wind which would otherwise tell upon them to a disadvantage. To effect this, the alternate quarters (a), of the Cap are closed, and help in the necessarily oblique position by a transverse symmetrical vane (b), at the top; by which also the cap is hung upon a central pivot. The concave side of each motile blade is thus alone exposed to the wind, while the convex side comes up under one of the closed quarters of the Cap (a), with much diminished resistance. Moreover, the closed off quarter of the Cap is so arranged as to reflect the current of air in the direction of the movement, and thus supplement the primary force.

(4)—The accessories worthy of notice are two cross rods, bent twice at right angles, which form a frame-work carrying the pivot for the Cap in the centre above, and beneath this, the socket for the upper pivot of the fan spindle. The lower pivot of the latter works in a socket (5), on a transverse piece within the shaft.



GENERAL REFERENCES TO THE FIGURES.

1.—The Motile Fan.
2.—The Aspiratory Fan.
3.—The Self-Adjusting Cap.
4.—The Spindle or Axis.
5.—Transverse Piece and Socket for lower pivot of the axis.
6.—Circular Plate between the Fans.
7.—Conical band, in A, with its base downwards, and its upper border connected with 6, but in B and C with the base turned upwards, leaving an interval between its upper border and 6 for the passage of air, and between its own border and the top of the Shaft for the drainage of moisture.
8.—The Air Shaft.
9 and 10.—Fig C, the Syphon and Pan respectively.

Of course, a propulsive effect will be produced by inverting the "Aspiratory Fan," and introducing it within the space to be ventilated, which is also provided for in the terms of the patent.

II.—Of the "Double Ventilating Shaft." —The more we study the subject of ventilation the more clearly we perceive it to be necessary to make provision for the ingress of fresh air, as well as for the escape of that which has been rendered impure. With either alone, *i.e.*, ingress or egress, the system must be imperfect, but with both, on a suitable scale, the ventilation of enclosed spaces will be made more nearly to resemble open air conditions. Indeed, a hint may be derived from Nature to the same effect, for although the bivalve mollusca breathe in water, their respiratory currents enter and pass out by distinct channels or syphon tubes, and the movement is effected by mechanical means, namely, the action of vibratile cilia. Several attempts have been made to obtain this result in a single apparatus. Thus, in Watson's principle, as in the ventilation of mines, a suitable septum in a tube divides the incoming from the outgoing current. In McKinnell's scheme an inner tube serves as an uptake, while an outer one conveys fresh air to the space to be ventilated; and a modification of this is occasionally seen, consisting of one tube within another, respectively surmounted by an aspiratory, and an indraught cowl. The plan which is now to be explained, however, differs from all others in having a central aperture of ingress as well as of egress, the intermediate portion of the main shaft being divided by a septum into two equal parts. By this arrangement a larger area is made, both for the escape of foul, and the entrance of fresh air, so as to facilitate the process of interchange, the aperture of ingress above, and that of egress below, including the whole circumference of the main shaft. The lower inlet may be expanded and perforated like the rose of a watering pot, or furnished in some simple way, so as to bring it under control and moderate the effect.

Of the various purposes to which this system may be applied, two or three merit notice at present.

When an aspiratory effect alone is required, the form shewn in Fig A may be used, with, or without the Self-Adjusting Cap. This form would be also well suited for the cure of smoky chimneys when the wind from some local cause exhibits a downward tendency; but under more ordinary circumstances, the form Fig B would be preferable, for in this case the movement is all in an upward direction, and the ascent of the smoke is unimpeded by any necessitated deviation from its natural course.

For the ventilation of soil pipes (a most important application of the "Twin-Fan Ventilator,") the arrangement shewn in Fig C will be most effective.

In a hygenic sense, the subject of house drainage is one of growing importance, so intimately connected as it must always be with increasing population. But, whatever system of drainage is adopted, it is quite certain that the thorough ventilation of the soil pipe is so indispensable that more or less ill health and discomfort must of necessity attend the neglect of it. Nor is this the less certain because it is so lightly considered by the public in general. In rural districts, where no common system of sewage exists, the evils referred to are so obvious that water-closets are usually placed altogther outside the house; and when they are permitted to be within the walls, the fact will be sure to make itself evident under certain circumstances, as in changes of weather. On the other hand, even should there be a common system of sewerage, with the free intercommunication of the houses thus established, but little improvement will be effected in the discomfort, and in the event of specific diseases appearing in the locality, the probability of its spreading far and wide is much increased. In some seaport towns, *e.g.*, Scarborough and Southampton, at certain times with the returning tide, a liquid piston, so to speak, ascends the main sewer, carrying the foul air before it, which is injected so forcibly into the conduits leading from the houses as to bubble through the water in the closet pans. Indeed, this was notably the case in certain houses which were visited with typhoid fever. Now all occurences of this kind would be obviated by fixing a ventilating tube into the summit of the soil pipe end of the syphon in the closet after the manner shewn in Fig C, surmounting it with a miniature "Twin-Fan Ventilator" at the top of the house, clear of all the windows. This method, by practical trial, has already proved to be satisfactory in every case in which it has been adopted.

APPARATUS FOR LIGHTING, WARMING, & VENTILATING RAILWAY CARRIAGES.

The defective ventilation of railway carriages is a matter of experience, not only in close and sultry weather, when there is little or no circulation of the air, but, under the very opposite conditions, when cold irregular currents discomfort the passengers, though still, strange to say, there is an insufficient supply of pure air; and only a partial removal of that which has already served its purpose in respiration.

Under existing circumstances, no benefit whatever is derived from the heat of the lamps as an auxiliary to the ventilation, for even the air required for combustion is supplied from without, and the lamp-bowls are made to fit the openings that receive them so closely as to preclude the escape of much air from the space below. Several reasons may be adduced for this, viz., to economise space, to preserve the integrity of the carriages as much as possible, to protect the lamps from the interference of the public, and to prevent the entrance of moisture. Now all the desiderata just mentioned have been duly borne in mind while the apparatus, presently to be described, was being planned, with the additional purpose of improving the ventilation, by taking advantage of the extracting and warming properties of the heat evolved by the lamps, and the wind power generated by the motion of the carriages themselves. By this latter power fresh air is impelled down an inlet tube (see Fig 1) over the heated surface of the lamp funnel and reflector, and delivered with its chilliness removed into the interior of the carriage.

The vitiated air, on the other hand, ascends around the inlet tube, and meeting with the products of combustion, is driven off by the "Twin-Fan Ventilator" surmounting the arrangement.

When the lamp is not required, the ventilation will still be effective without it, and if the action is excessive, it may be checked immediately by locking the fans and closing the inlet. Every essential part of the apparatus is, therefore, quite under control; but the locking of the fans, and turning on or off the gas can only be done by one of the company's attendants. The scheme of arrangement may be now more particularly described, with the aid of the accompanying diagram, giving an elevation of it, on a scale of four inches to the foot; or one-third the natural size.

The lamp-bowl (19) is of simple rounded form, so as to cast the light evenly in all directions. The flanged rim rests on a metal ring, sustained by four short vertical rods (20), secured at equal distances around the lower border of the opening. The gas pipe (21), with its cock just above the roof, having traversed a passage in in the wood-work, enters the bowl on the corresponding side. So far the apparatus may be regarded as fixed, requiring no removal, except for repairs (as in Fig 2 B). All the other parts, however, are removable as a whole, consisting of the reflector (16) and chimney (15) of the lamp, occupying the interior of the downcast tube (12), and its lower expansion (13), the principal shaft (8), and finally the "Twin-Fan" above, with its accessaries. The upper mouth (10) of the inlet tube is turned forwards to receive the current of air, which is warmed in its passage over the heated surface of the lamp-funnel and reflector, and flows, without sensible draught, into the breathing space. A large area is afforded for the escape of impure air around the inlet tube, above its expansion; but this latter, it will be readily seen, must reach at least one inch below the lower margin of the opening in the roof, or it would materially encroach upon the outlet. Here we have a practical difficulty to overcome, in reference to the position of the lamp, for it is desirable that it should not be brought down so low as to incommode the passengers.

Now, although the existing opening which is about 8½ inches in diameter, need not be exceeded, it might be raised at least three inches in the circular area of a foot or 14 inches in diameter, which would not only also raise the position of the lamp, but give more room for the passage of the ventilating currents in both directions above the rim of the bowl. This concession, which would be comparatively inexpensive, would render the whole apparatus more effective, and detract but little, if anything, from the integrity or general strength of the roofing. Moreover, the size of the lamp-bowl might be somewhat reduced, and thus, further the same end with, probably, no disadvantage whatever. The accompanying diagram will afford any additional information that may be desirable in reference to this scheme. Of course, if extraction alone were considered sufficient, no change of any kind, except for the gas arrangement, need be made. A reflector of 7 inches in diameter would have a margin of 18.25 square inches, so that the lamp might be only let down through the opening, so far as to make the reflector effective. A very considerable area would be thus provided for the escape of vitiated air, besides that consumed by the lamp, or carried off with the products of combustion. By restoring the simple curve or lines of the roof, drawing up the lamp, and omitting all the parts numbered from 9 to 14 in Fig 1, a good idea of the plan here suggested, and shewn in Fig 2, may be formed.

For smoking carriages it would be invaluable, and indeed, under any circumstance, no more potent means of ventilation, could be employed, than the combination of the extractive power of heat with that of the rotatory fan, and this without further cost to the Company adopting it than the primary outlay for the apparatus.

EPITOME OF THE NEW GERMAN PATENT LAW.

THE new German Imperial Patent Law has just been passed by the "Reichstag," and will come into force on the 1st of July, 1877. This new law puts an end to the confusion concerning patents in Germany, that has hitherto existed, there being at the present time 21 different states granting patents of their own. These will be all embraced under the one law after the 1st of July.

Pharmaceutial compounds, medicines, alimentary preparations, and *chemical products* cannot be patented under the new law. But the *processes* by which these articles are obtained can be patented. An invention must be novel and not have been introduced to the public, so that another person could practise the same. Imported inventions are not patentable, except by the real inventor. This new law makes it unlawful to manufacture a patent article, to import the same from another country, or even to use a patented machine, tool, apparatus, or process. But anyone having an invention in use cannot be prevented from continuing to use the same.

Fifteen years is the term of patent.

The TAXES are 50 marks (£2 10s.) for the first year, 50 marks (£2 10s.) for the second, 100 marks (£5) for the third, and so on, with an addition of 50 marks per annum; thus a 15 years patent costs 5,300 marks (£265). Patents of addition are granted at a cost of 50 marks. The taxes may be paid three months after date.

The cancellation of patent rights may be effected by the Government after three years, if the invention has not been carried into operation to a proper extent, or if the inventor has not taken the necessary steps to carry the patent into effect, or if he refuses licenses to others who offer a fair royalty, and it is advisable for the public good to grant such licenses.

Anyone having obtained a patent for improvements on a patented article, and wanting a license from the first inventor, is obliged to give the latter a license for his improvements. Foreigners must empower a German citizen to make their applications.

EXAMINATION of applications will be made by the patent commissioners and experts appointed for this purpose. But *appeal* can be made in case of refusal to a *special commissioner*, and from him to the *Imperial Court* at Leipsic. In the case of *poor inventors* the payment of taxes can be postponed for two years, or altogether remitted.

SPECIFICATIONS and drawings, which have to accompany applications, can be inspected immediately after the application; and on account of this patents should be taken in other countries first. Opposition, it would seem, can be made to grant of patent.

PUBLICATION OF PATENTS takes place on issue thereof, a short specification of the same having to be published in the *Patent Journal*. Before the lapse of a patent notice has to be given to the inventor, and a proper time allowed him to fulfil the requirements of the law. Infringements of patent rights are punished with a fine up to 10,000 marks (£500), or imprisonment not exceeding one year.

Marking articles patented, which are not, is punished with a fine of 150 marks (£7 10s.)

At the publication of the invention, anyone, thinking he has a prior right, may enter an opposition, which is then examined in the presence of those concerned.

Existing German patents may be transferred to the Empire, but cannot be prolonged.

THE INVENTORS' INSTITUTE,

ESTABLISHED 1st MAY, 1862.

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HELD AT

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The various efforts which have been made, and the numerous influences now at work to injure, if not destroy, Patent Rights; the inefficiency of the many well-intended, but ill considered, Schemes of Patent Law Reform, which have from time to time been suggested, and the tendency of which has generally been to prejudice the Inventor without advantage to the Public; together with the proceedings so essentially involving the interests of Inventors which have already taken place in Parliament, as to the propriety of abolishing Patent Rights altogether, show the necessity of an immediate and active co-operation on the part of those interested in Inventions and in Patent Property, and that an Association for the Protection and Defence of Patent Rights is urgently needed. This Institute has, therefore, been established for the purpose of uniting and organising the influence of Inventors, Patentees, and others. Its objects are:—

1st. To protect Inventors' interests, and defend the privilege of obtaining Her Majesty's Letters-Patent.
2nd. To promote improvements in the Patent Laws.
3rd. To facilitate the diffusion of information with reference to Inventions, and other subjects beneficial to Inventors and Patentees.

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OBJECTS OF THE ASSOCIATION.

To obtain Patents for Inventions in this and other countries.
To Register Designs.
To aid in forming Public Companies, and in Publicly introducing Patented Inventions.
To aid in Selling and Licensing Patented Inventions.
To furnish advice and professional Assistance in developing Inventions.
To collect Evidence, arrange Arbitrations, and otherwise assist Inventors in maintaining their rights.

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